Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

★ APR 21 1933 ★
AGRICULTURAL ECONOMICS
U. S. DEPARTMENT OF AGRICULTURE

Copy 1

CIRCULAR No. 268 MARCH, 1933
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

GOLDEN CROSS BANTAM SWEET CORN[1]

By Glenn M. Smith, *Assistant Pathologist, Division of Cereal Crops and Diseases, Bureau of Plant Industry*

CONTENTS

Page
Introduction 1
Origin 2
Characteristics 2
  Adaptation 2
  Resistance to bacterial wilt 3
  Yielding ability 3
  Uniformity 4
Technical description 4
The inbred parents of Golden Cross Bantam 6
  Purdue Bantam 6
  Purdue 51 8
Seed stocks 12
Producing seed for Golden Cross Bantam 12

INTRODUCTION

Golden Cross Bantam is a new hybrid sweet corn of high quality both for roasting ears and for canning purposes. It is high yielding and resistant to bacterial wilt. This hybrid can not be reproduced from its own seed. It is produced only from crossed seed obtained by controlled cross-pollination of two inbred lines, designated Purdue Bantam and Purdue 51.

Corn as grown in the field is largely cross-pollinated, the pollen, spread by the wind, coming from plants other than the one producing the seed. For this reason the seed will produce plants differing, at least in some respects, from the parent plant on which it is produced. By self-pollination, that is, pollinating each plant with its own pollen, and carefully selecting, it is possible to isolate strains or lines that are reasonably pure for many characters. The progeny of any such line will be essentially the same as the parent. Such inbred lines, however, usually lack vigor. Inbred lines crossed with one another by controlled pollination produce crossed seed, and the crop from this seed, that is, the hybrid, is much more vigorous in growth and more productive than the parent inbreds. If the inbreds have been carefully selected and undesirable characters eliminated during the inbreeding process, and if the inbreds mate or " nick " well, the hybrid is superior to the original open-pollinated variety, both in yield and in other characters for which the inbreds have been selected. The seed from the hybrid, however, is no longer pure for different characters, except those that are common to both parents, and the plants grown from the second or later generation

---

[1] Investigations conducted in cooperation with the Purdue University Agricultural Experiment Station, La Fayette, Ind.

160855°—33

seed are variable and usually are less vigorous and less productive than those of the first-generation hybrid.

The name Golden Cross Bantam applies only to the seed obtained directly by crossing Purdue Bantam and Purdue 51 and to the plants grown from that seed. It is only in this first generation that the full value of the cross occurs. This value can be obtained only by planting first-generation crossed seed each year. It is the purpose of this circular to describe the new hybrid and the two inbred parent lines, and to give brief directions for growing the crossed seed for producing Golden Cross Bantam.

ORIGIN

Golden Cross Bantam, a new hybrid sweet corn, was developed as a phase of the sweet-corn disease investigations conducted cooperatively by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station at La Fayette, Ind. Golden Cross Bantam is a single-cross hybrid, produced by controlled cross-pollination of two inbred strains of yellow sweet corn, designated as Purdue Bantam and Purdue 51, respectively. These two inbred strains were isolated from two commercial strains of Golden Bantam sweet corn, the seed samples of which were received in 1923 from the Division of Seed Investigations, Bureau of Plant Industry, United States Department of Agriculture. The inbred that has been designated Purdue Bantam was selected toward a high number of rows of kernels in the ear and toward sturdiness of plant growth; the one designated Purdue 51 is an 8-row type, which produces abundant pollen. After the two strains had been inbred and selected for six years, the first trial cross between the strains was made. On the basis of its performance in succeeding seasons, this single cross was selected from among many crosses as one of the best hybrids for commercial production.

CHARACTERISTICS

The value of Golden Cross Bantam may be most readily estimated by comparing it with Golden Bantam.

Golden Cross Bantam is similar to Golden Bantam in its yellow kernel color and in its high quality for roasting ears and for canning purposes. However, this hybrid is sturdier and more productive than Golden Bantam, and is highly resistant to bacterial wilt (Stewart's disease) (*Aplanobacter stewarti* (E. F. Smith) McCul.), while Golden Bantam is highly susceptible to this disease. The hybrid also is from four to eight days later than Golden Bantam.

ADAPTATION

Trials with Golden Cross Bantam were conducted in Indiana from 1928 to 1932. Field trials were conducted also in Ohio, Illinois, Iowa, Michigan, Wisconsin, Minnesota, and New York during the same period. The results of these trials have been uniformly satisfactory. Results of trials in 15 other States for 1, 2, or 3 years indicate that this strain is adapted to a wide range of soils and growing conditions. However, this hybrid may prove somewhat late for use in the extreme northern belt of States, where only the earliest-maturing varieties of sweet corn can be grown satisfactorily.

In a number of trials in 1931 and 1932 Golden Cross Bantam was subjected to conditions of severe drought and to periods of excessively high air temperatures during ear formation. Under these conditions it was able to produce well-filled ears, while strains of commercial Golden Bantam were totally unproductive.

RESISTANCE TO BACTERIAL WILT

Golden Cross Bantam has shown high resistance to bacterial wilt (*Aplanobacter stewarti*) in sections where open-pollinated strains of Golden Bantam were highly susceptible to this disease. (Fig. 1.) For three consecutive years under such conditions this strain has shown less stalk infection with the wilt organism than has any commercial strain of sweet corn that reached the roasting-ear stage at the same time. Golden Cross Bantam promises to fill a need for a yellow sweet corn of rather early maturity for use especially in localities where bacterial wilt is prevalent.

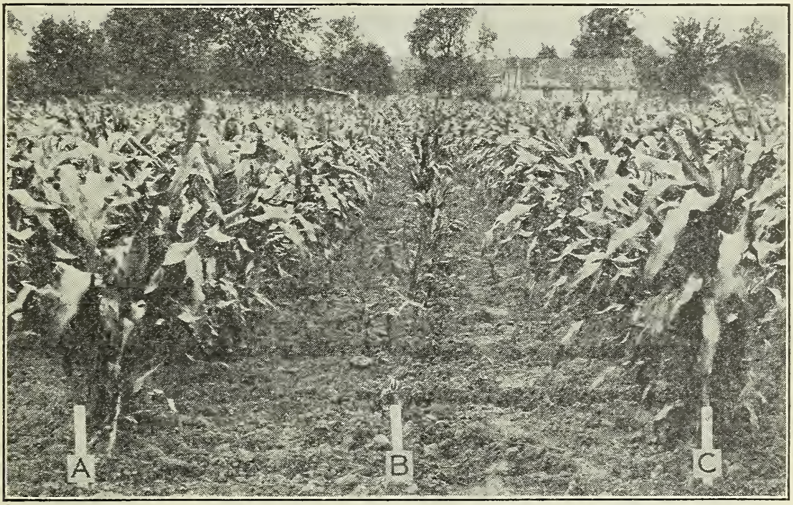

FIGURE 1.—Rows in foreground are: A and C, Golden Cross Bantam, not injured by bacterial wilt; B, commercial Golden Bantam, killed by bactérial wilt. La Fayette, Ind., 1931

YIELDING ABILITY

In trials conducted for three years at La Fayette this hybrid produced, on the average, 3.84 tons of green corn per acre, as compared with 2.49 tons of green corn per acre obtained from the highest-yielding open-pollinated strain of Golden Bantam grown under comparable conditions. On the basis of cut corn from ears in prime canning condition, Golden Cross Bantam produced 26 per cent more than this strain of open-pollinated Golden Bantam. During the period of its development Golden Cross Bantam has occasionally been compared with larger-eared and later-maturing yellow varieties, such as Whipple Yellow, Bantam Evergreen, and Golden Evergreen, and has been consistently superior to them in yield. In cooperative trials in the various States this hybrid has uniformly produced more green corn than have strains reaching the canning stage at comparable dates.

UNIFORMITY

Golden Cross Bantam matures more evenly than open-pollinated strains. This means that under reasonably uniform conditions of soil fertility and moisture supply a high percentage of the ears will be in prime roasting-ear condition at one picking. Under good growing conditions the plants of this hybrid develop ears that are remarkably uniform in size and shape.

TECHNICAL DESCRIPTION

This description of Golden Cross Bantam applies to the F_1 generation of the single cross, Purdue Bantam × Purdue 51, and chiefly to plants in the roasting-ear stage.

Golden Cross Bantam is an early midseason hybrid, typically 4 to 8 days later than Golden Bantam. In Indiana and States of the same latitude it reaches the roasting-ear stage in 85 to 95 days after planting. In States farther south this period may be shortened from 10 to 15 days, and in those farther north, where late planting is practiced, it may be shortened from 7 to 10 days.

The stalks average 6 feet in height but may range from 4 to 7½ feet, depending on environment. (Fig. 2.) The main stalk is sturdy and straight and usually develops 10 nodes above the soil line. The internodes are long and nearly straight and are light green in color. The brace roots are coarse and occur in an incomplete whorl at the first node above the soil. Under favorable growing conditions two to five suckers are produced on each plant, but usually these suckers do not bear ears.

There are usually 8 to 10 leaves per plant. The blades are long, stiffly arching, and dark green. The blades at the upper ear nodes average 4 inches in width and 34 inches in length. The margins of the green leaves are slightly wavy and bordered with short hairs. Those of the mature leaves are smooth. Midribs are pale green, prominent, and broad. The ligules are complete, long, and solid green. The sheaths are typically longer than the internodes.

The tassels are coarse and usually average about 18 inches in length. The terminal spikes are erect. The 10 to 18 simple lateral branches are spreading and scattered and are green at their bases. The glumes are light green, closely striped with dark green. The mature anthers are light green.

Under favorable conditions two ears are usually produced on each stalk, at the fourth and fifth nodes. The upper ears are borne 18 to 24 inches from the ground. The ears are borne almost erect, 5° to 10° from vertical, on short, thick, brittle shanks. Each ear is well covered and tightly wrapped by rather thin husks. Usually about half of the husks carry moderately long leaf blades. The silks emerge freely and are green. The husked ears are about 8 inches long, nearly cylindrical, and have 10 to 14 rows of kernels in straight or slightly winding rows. (Fig. 5, B.) The cobs, which are white,

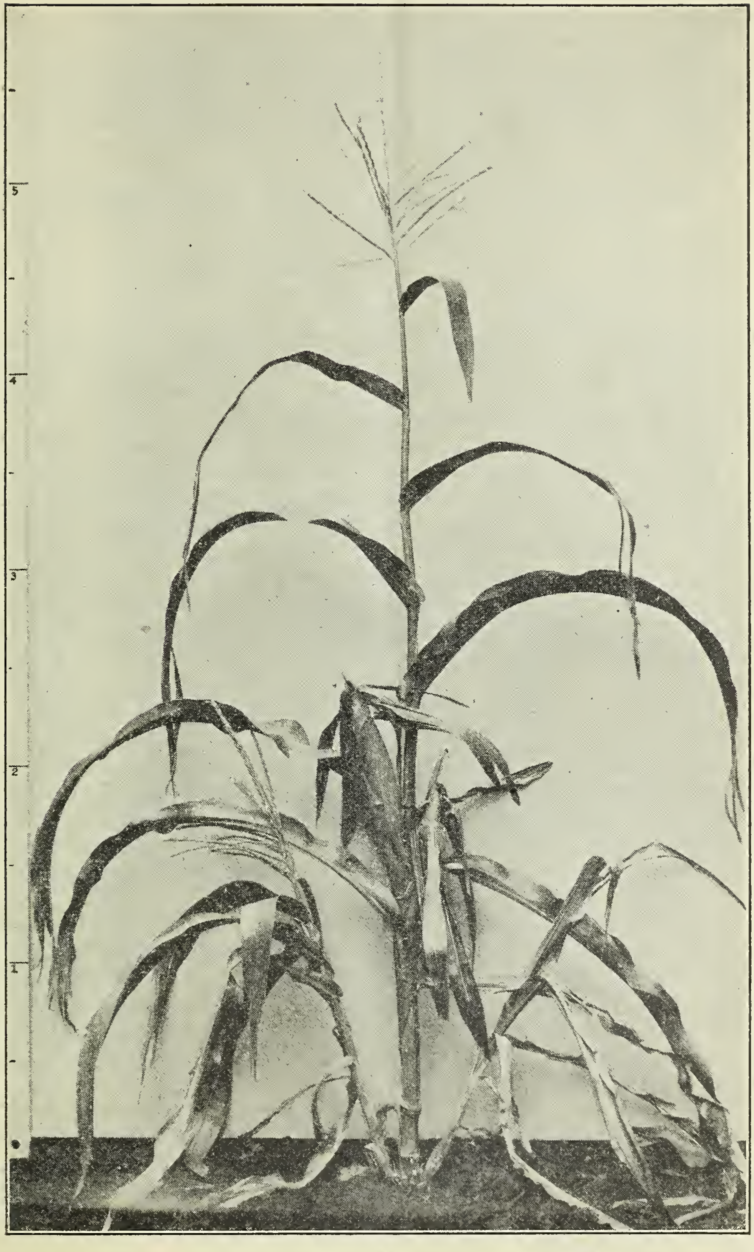

Figure 2.—Golden Cross Bantam in the roasting-ear stage

taper slightly toward their tips for the upper three-fourths of their lengths and have well-rounded tips.

At the canning stage the kernels are of medium size and of the same general shape as those of commercial Golden Bantam except that they are somewhat narrower and slightly deeper. At this stage the kernels are light golden yellow, have a tender pericarp, and harden somewhat less rapidly than do those of Golden Bantam. The dry mature kernels are dark orange and weigh about 260 grams per 1,000 seeds.

THE INBRED PARENTS OF GOLDEN CROSS BANTAM

PURDUE BANTAM

CHARACTERISTICS

During two years' trials at La Fayette, Purdue Bantam produced more green corn than did any of the commercial strains of Golden Bantam in the trial plots. It produced a high percentage of prime ears, and the cutting percentage was excellent.

The plants of this strain have a sturdy growth habit. (Fig. 3.) They differ from Golden Bantam in having somewhat thicker stalks and in the tendency to have fewer suckers. The plants have a characteristic gray-green foliage and typical yellowish-green silks and anthers. Their wavy leaf margins are also rather characteristic. The plants develop somewhat more slowly than those of commercial Golden Bantam, but at maturity they equal those of that variety in height. The ears (figs. 5, A, and 6, A) are slightly longer than those of the average Golden Bantam, and their diameters are somewhat greater.

TECHNICAL DESCRIPTION

Purdue Bantam is an early midseason strain, typically 5 to 10 days later than Golden Bantam. In Indiana and States of the same latitude it reaches the roasting-ear stage in 85 to 95 days after planting. In States farther south this period may be shortened from 10 to 15 days, and in those farther north, where late planting is practiced, it may be shortened 7 to 10 days.

The stalks average 5 feet in height under average environmental conditions in the Central States, and may range from 4 to 6 feet under different conditions. The main culm is straight and slender and develops 10 nodes above the soil line. The internodes are light green, long, and nearly straight. The brace roots are coarse and form an incomplete whorl. Very few suckers are produced, except on very rich soils.

The leaves are light gray green, a distinguishing character of this inbred. The blades at the upper ear nodes average 3½ to 3¾ inches in width and 30 inches in length. The margins are wavy; the midribs are prominent, broad, and pale green. The ligules are complete, long, and solid green. The leaf sheaths are as long as the respective internodes.

The tassels are coarse and usually about 10 inches long. The terminal spikes are erect. The 6 to 12 simple, lateral branches are light green at their bases, and are rather crowded and stiffly spreading.

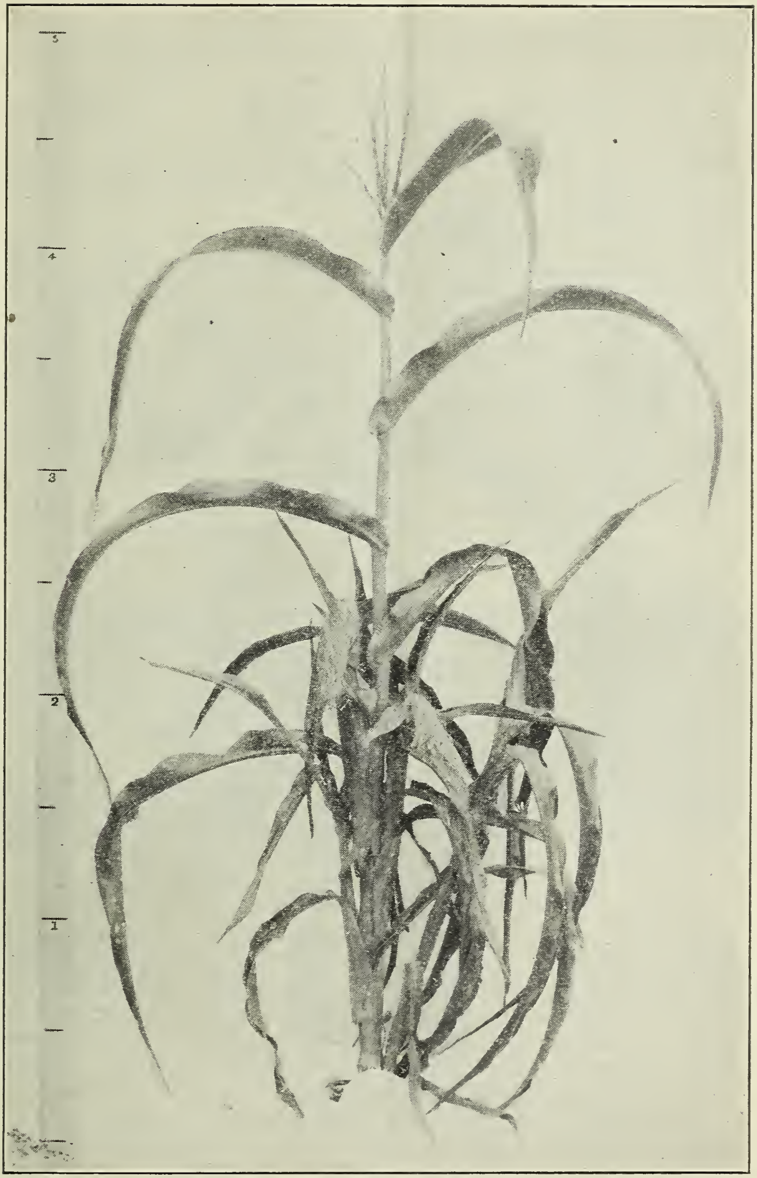

Figure 3.—Purdue Bantam in full silk. Note sturdiness of main culm, abundance of silk development, and comparative freedom from suckers

The glumes are pale green heavily striped with dark green. The anthers are light green at the time of shedding pollen.

Under favorable conditions two ears may be produced on each stalk. When one ear is produced it usually is borne at the fifth node, about 18 inches from the ground. The ears are borne almost erect, 5° to 10° from vertical, on thick, brittle shanks. The husks are thick and long and are wrapped tightly about the ear. About half of the husks carry rather long leaf blades. The silks emerge freely and are green. The husked ears (figs. 5, A, and 6, A) are long, slender, and slightly tapering. There are 10 to 14 straight or slightly winding rows on each ear. The cobs are white and relatively slender.

At the canning stage the kernels are light golden yellow, medium to small in size, and of the same depth as those of commercial Golden Bantam but somewhat narrower. The dry mature kernels are slightly smaller than those of Golden Bantam. Their depth is typically greater than their width. The kernels are truncately wedge shaped with nearly square shoulders at the base. They have very coarsely wrinkled, slightly rounded crowns, which make distinct angles with the lateral surfaces. The kernels are set tightly on white cobs. The dry mature kernels are light orange in color and weigh about 160 grams per 1,000 seeds.

PURDUE 51

CHARACTERISTICS

Purdue 51 in most respects resembles very closely the best strains of Golden Bantam. However, it is slightly later, more uniform, and somewhat more slender. It produces tassel-bearing suckers in abundance (fig. 4), as does Golden Bantam, and its ear and kernel characters are nearly identical with those of Golden Bantam. It sheds pollen slightly later than does Purdue Bantam.

The principal distinguishing characteristics of this inbred strain are the stiffly erect position of the leaves and the large number of suckers. The silks and anthers resemble those of Purdue Bantam.

TECHNICAL DESCRIPTION

Purdue 51 is an early midseason strain, typically 6 to 12 days later than Golden Bantam. In Indiana and States of the same latitude it reaches the roasting-ear stage in 85 to 100 days after planting.

The stalks are 4 to 4½ feet in height. The main culm is straight and slender and develops 10 nodes above the soil line. The internodes are light green and are straight and medium in length. Relatively few brace roots develop. They are slender and form an incomplete whorl. The suckers, which are numerous, averaging four per plant, are slightly shorter than the main stalk. The suckers usually all bear tassels, but few produce ears. The leaf blades are long, narrow, and dark green. The blades at the upper-ear node average 3¼ inches in width and 36 inches in length. The margins are slightly wavy and produce dense hairs about one-sixteenth inch long. The midrib is prominent, broad, and stiff, holding the leaf rather erect. The ligule is complete, short, and solid green. The leaf sheaths are some-

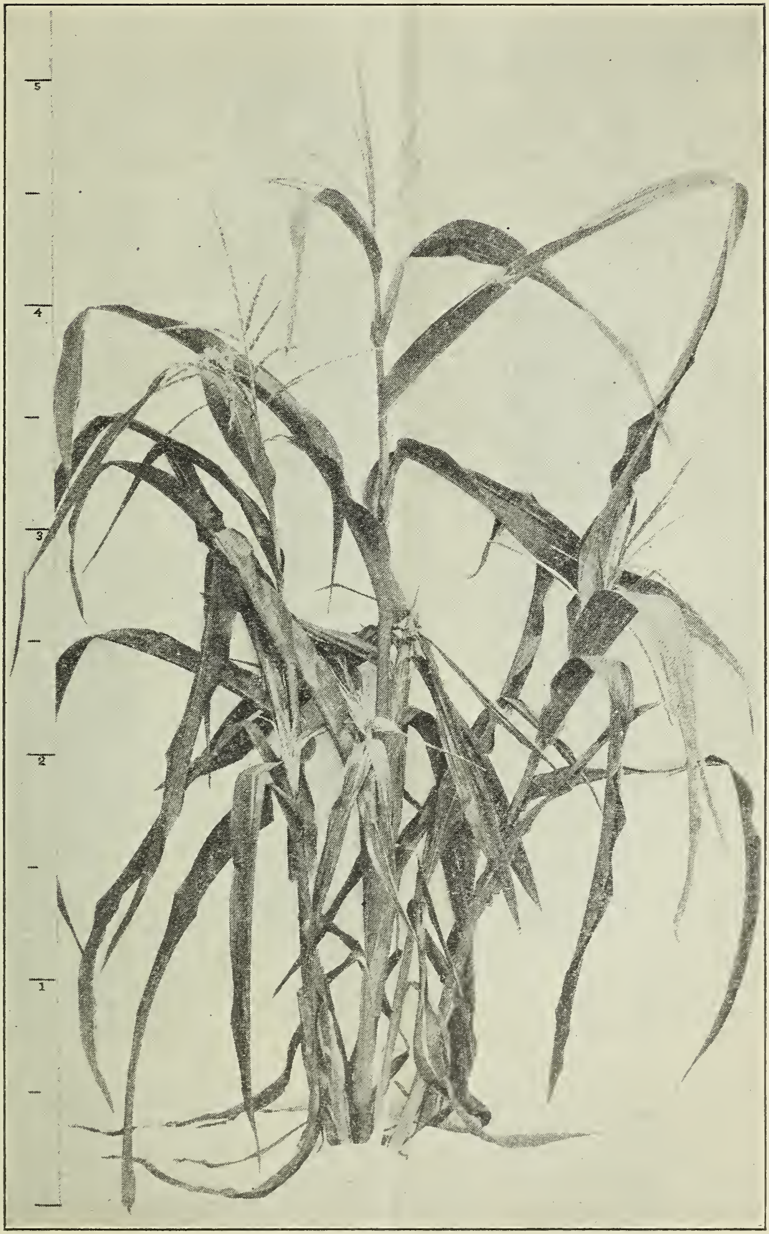

FIGURE 4.—Purdue 51 in full silk. Note erect leaves on slender main culm and abundance of tassel-bearing suckers

what longer than the internodes. The tassels are about 15 inches long and are slender and feathery. The terminal spikes are erect and the 10 to 20 simple lateral branches are spreading and drooping. The glumes are light green closely striped with dark green. The mature anthers are pale green.

There usually is only one ear on a stalk, and it is borne at the fifth node, about 18 inches from the ground. The shanks are short, slender, and brittle. Each ear is tightly wrapped and well covered by about 12 husks, the outer 6 to 9 of which carry moderately long leaf blades. The silks are green and tend to be short and to emerge tardily. The husked ears (figs. 5, C, and 6, B) are medium long, slender, and cylindrical, with kernels in 8 to 12 straight or slightly winding rows. The cob is white, small, and relatively slender. When the ears are mature the dry kernels are medium to large, approximately the same size as the average kernels of Golden Bantam. The width of the kernels is equal to or slightly greater than the depth. The kernels are reniform, with rounded shoulders, and have finely wrinkled, distinctly rounded crowns. The dry mature kernels are dark orange and weigh about 215 grams per 1,000 seeds.

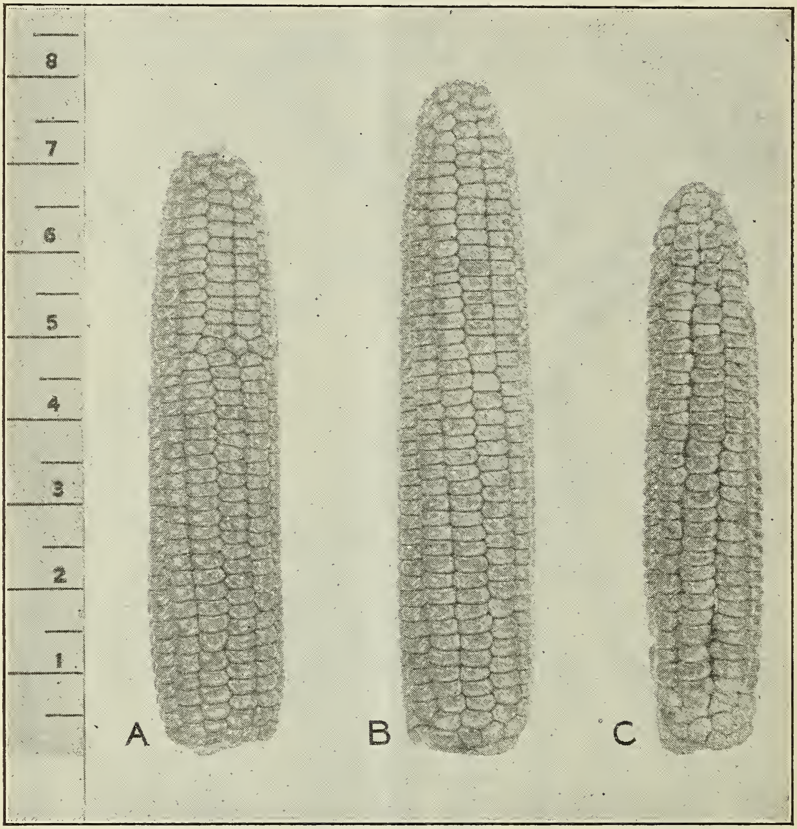

FIGURE 5.—Ears at canning stage: A, Purdue Bantam; B, Golden Cross Bantam; C, Purdue 51

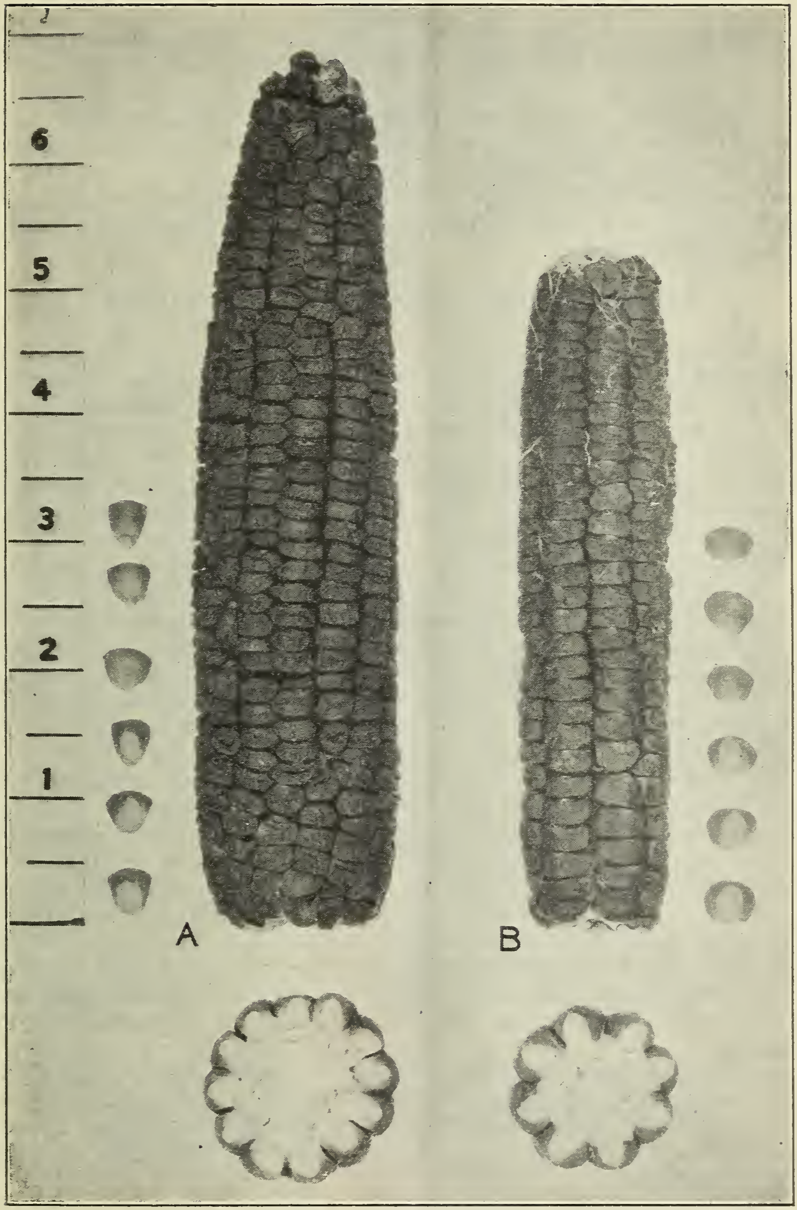

FIGURE 6.—Seed ears, side and cross-section views, and representative kernels: A, Purdue Bantam; B, Purdue 51

SEED STOCKS

The success of the field trials of Golden Cross Bantam has created an unusual demand for seed stocks for the production of this hybrid. Seed of Purdue Bantam and Purdue 51 for the production of Golden Cross Bantam was first made available to commercial seed growers in the spring of 1932. Therefore, some producers should have a limited quantity of the crossed seed available for planting in 1933. The United States Department of Agriculture has no inbred or crossed seed for sale or distribution.

Foundation stocks of the inbreds are being maintained in small quantities at the Purdue University Agricultural Experiment Station at La Fayette, Ind.

PRODUCING SEED FOR GOLDEN CROSS BANTAM

Seed from which Golden Cross Bantam is grown is the result of controlled cross-pollination of Purdue Bantam by pollen from Purdue 51. In producing this seed in quantities for commercial use, isolated crossing fields are planted with rows of the pollinator strain, Purdue 51, along with rows of Purdue Bantam. Ordinarily, such fields are planted with two rows of Purdue Bantam alternating with a single row of Purdue 51. This is the minimum amount of pollinator that has been found satisfactory for securing full pollination.

When tassels begin to emerge in the crossing fields it is necessary to remove all tassels from the plants of Purdue Bantam before any pollen is shed. Detasseling may be accomplished most efficiently by hand jerking. It is necessary to go over such fields daily at the peak of the pollination season. After being detasseled, the plants are allowed to mature in the usual manner. Only seed borne on the detasseled plants of Purdue Bantam is used for producing the crop of Golden Cross Bantam the following year.

The seed of Purdue 51 from the pollen parent rows in the crossing field is, of course, inbred, and may be saved and used for planting the pollinator rows in a crossing field another year. With reasonable care in isolating the crossing fields from other corn, in roguing these fields for the removal of off-type plants before pollination, and in timely detasseling of the seed-parent rows of Purdue Bantam, it should be possible to select sufficient pure seed from the crossing field each year for planting pollen rows the following year. Purdue 51 is recommended for use as a pollen parent because it produces a number of pollen-bearing suckers and is slightly later than Purdue Bantam.

Seed stocks of Purdue Bantam may be maintained in a small plot in a well-isolated field, planted either alone in a multiplying plot or as a pollinator in a crossing field. Purdue Bantam makes a good seed parent because of its relatively high yielding ability in the inbred condition.

Seed from Golden Cross Bantam will not produce a crop as uniform as Golden Cross Bantam, nor will the yield be as good as that of the first-generation hybrid.

U. S. GOVERNMENT PRINTING OFFICE: 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - Price 5 cents